Met Office Space Weather Technical Forecast

Space Weather Technical Forecast- CORRECT VERSION OF SOLAR ANALYSIS

Issued on Thursday, 20 October 2022 at 15:43 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

---

Space Weather Forecast Headline: No significant activity.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity over the past 24 hours has been Low, with occasional low level C-class flares, the largest a C5 flare at 20/0326 UTC from AR3122. There are two numbered and one un-numbered region currently on the visible disc. AR3126 is the largest, though remains stable. A NEW region in the southeast is a weak unipolar Axx/alpha. AR3124 has rotated around the southwest limb.
No Earth directed CMEs were visible on available satellite imagery.
Solar Wind / Geomagnetic Activity: The solar wind, as observed by DSCOVR at L1, has been slightly elevated around 410km/s. The density was near to below average. The total IMF strength, Bt, was weak below 7nT, with the north-south component, Bz, varying weakly between +3/-5 nT. The phi angle was negative (towards the Sun) throughout. Geomagnetic activity was Quiet (Kp 0-2) throughout the period.
Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured at GOES-16 has remained at background levels. High energy electron flux (greater than 2MeV) at GOES-16 was at mainly Moderate levels, with a peak flux of 914 pfu recorded at 19/1635UTC. The associated fluence was below the Active (1e8 integrated pfu) threshold on a generally flat trend, with 3.45e7 integrated pfu observed at 20/0001 UTC.

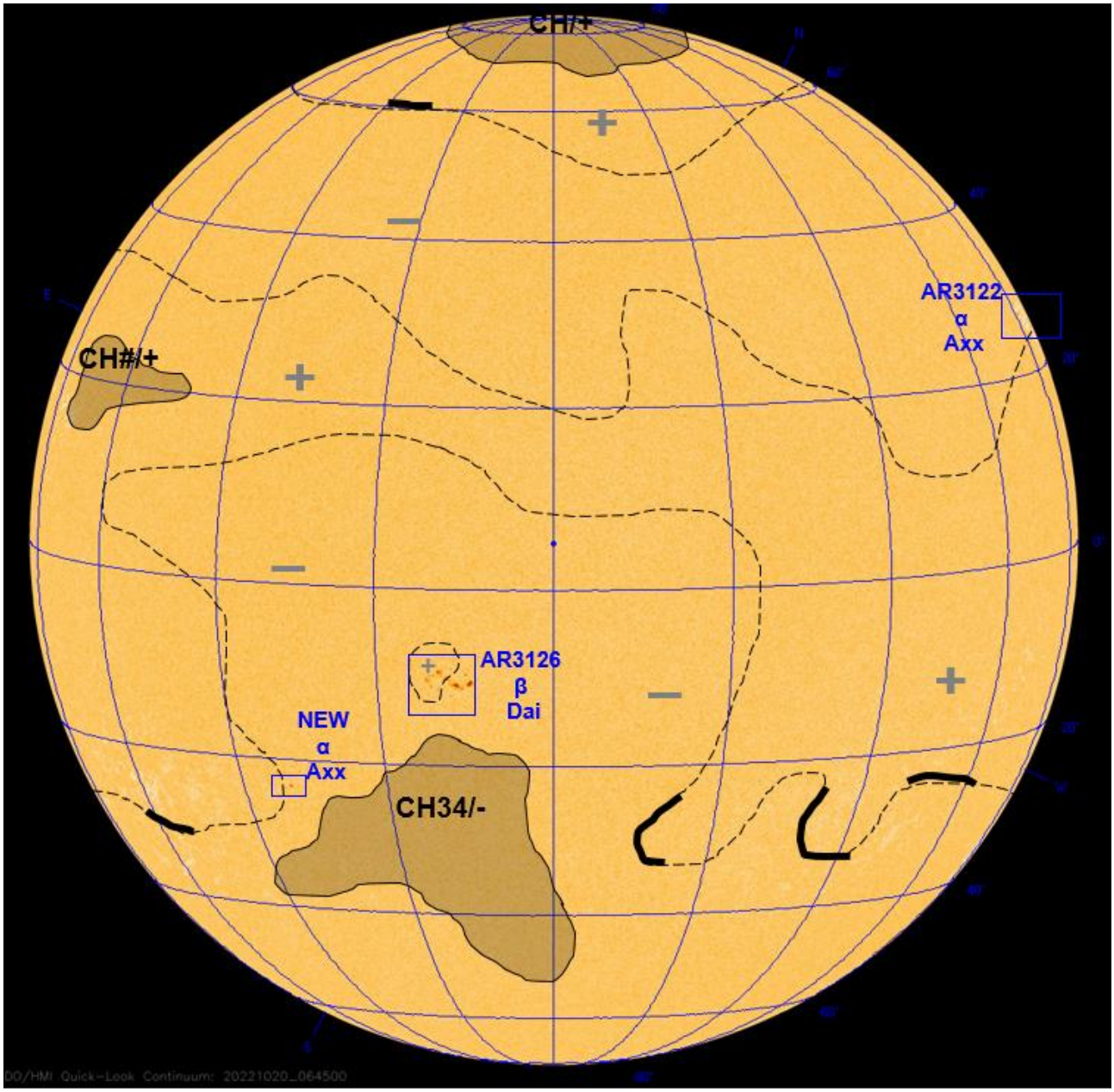
Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is most likely to continue Low, with a slight chance of an isolated M-flare.
Solar Wind / Geomagnetic Activity: There are currently no Earth-directed CMEs expected. Solar winds near background levels may experience a slight enhancement through days 1 to 2 (20th to 21st) due to any residual fast wind from the now closed CH33/+. A further enhancement is possible towards the end of the period due to the influence of CH34/-, although this is low confidence. Geomagnetic activity is expected to be mainly Quiet, occasionally Unsettled, days 1 to 2 (20th to 21st), perhaps with a slight chance of isolated Active intervals. There is then a chance of activity increasing to Unsettled to Active, with a slight chance of isolated G1/Minor Storm intervals, by the end of the period.
Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10MeV) is expected to be at background levels. High energy electron flux (greater than 2MeV) as observed by GOES-16 is expected to remain mainly at Background to Moderate levels. 24 hour Fluence levels are expected to remain below the Active (1e8 integrated pfu) threshold.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.

Figure 1. Solar Analysis Valid 20/0700 UTC. Corrected version



.

Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.

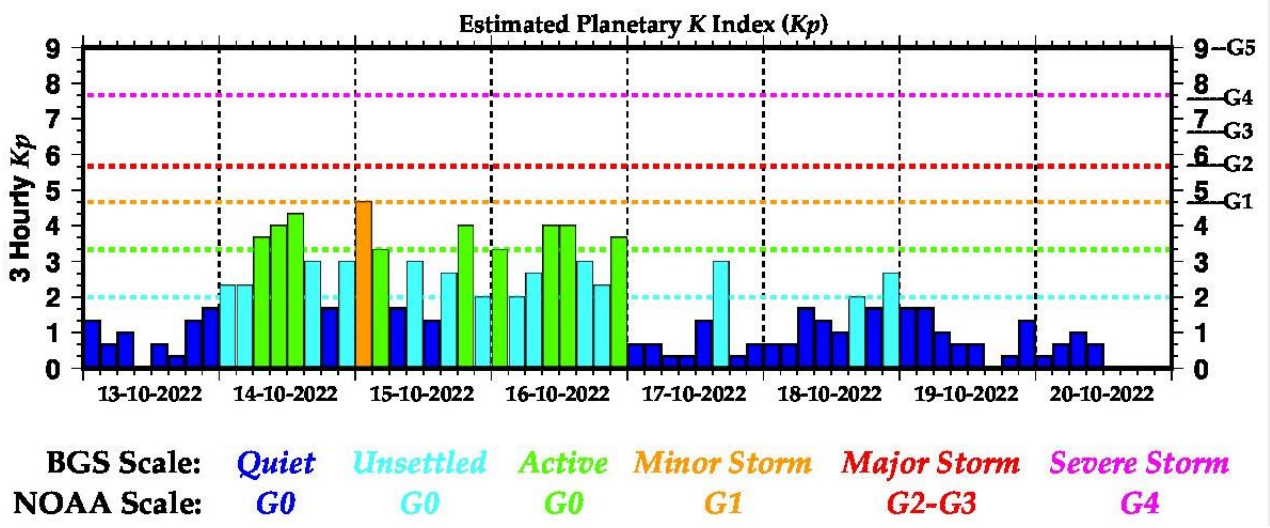
Geomagnetic Storms:

There are currently no Earth-directed CMEs expected.
Solar winds are expected to decrease further to near background levels following the recent fast wind enhancement from CH32/-. The next potential enhancement could come from a small and now closed coronal hole (CH33/+). This coronal hole was much smaller than on the previous rotation, and is now impossible distinguish. However, this was present in the central disc on the 17th, perhaps bringing a weak enhancement on days 1 and 2 (20th and 21st) with solar winds perhaps rising to around 450-500 km/s. Later day 3 (22nd), Enlil suggests a more significant enhancement arriving from southern disc coronal hole CH34/-. This is low confidence, however as whilst the coronal hole is larger and more distinct on this rotation, solar wind persistence would suggest the arrival of any fast wind enhancement isn't expected until the 24th.
Geomagnetic activity is expected to be mainly Quiet, occasionally Unsettled, days 1 to 2 (20th to 21st), perhaps with a slight chance of isolated Active intervals. There is then a chance of activity increasing to Unsettled to Active, with a slight chance of isolated G1/Minor Storm intervals, by the end of the period.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	5	5	20
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections- Nil

Figure 2: BGS Kp – Quiet.



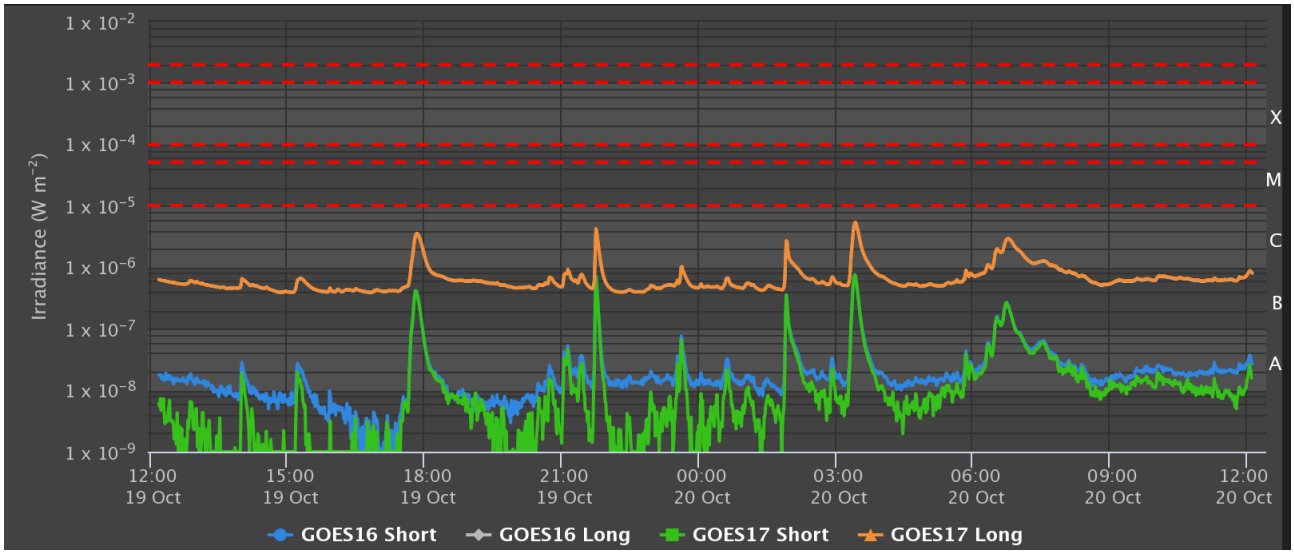
Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.

Radio Blackouts - X-Ray Flares:
Solar activity over the past 24 hours has been Low, with occasional low level C-class flares, the largest a C5 flare at 20/0326 UTC from AR3122 which has re-emerged as it approaches the west limb. There are two numbered and one un-numbered region currently on the visible disc. AR3124 has rotated around the southwest limb, with the un-numbered region in the southeast remaining a small, weak spot group.
Solar activity is most likely to continue Low, with a slight chance of an isolated M-flare.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	10	10	10	10
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3:GOES16 X-Ray flares



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.

Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) as observed by GOES16 is currently at background levels and is expected to remain at this level.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

High energy electron flux (greater than 2MeV) as observed by GOES-16 has exhibited a diurnal variation between Low and Moderate levels on a day-by-day basis. Solar winds have now eased to near background levels, with no notable increase in electron flux levels as the Van Allen Belts relax back to GEO. Peak flux levels are not expected to significantly rise again until beyond this period, and potentially suppressed to background should any fast winds from CH34/- materialise during the period.

The associated 24 hour electron fluence is expected to remain below the Active threshold (1e8), with REFM considered to be giving a good forecast trend.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	1	1
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.

Figure 4: GOES16 ElectronFlux- Background to Moderate

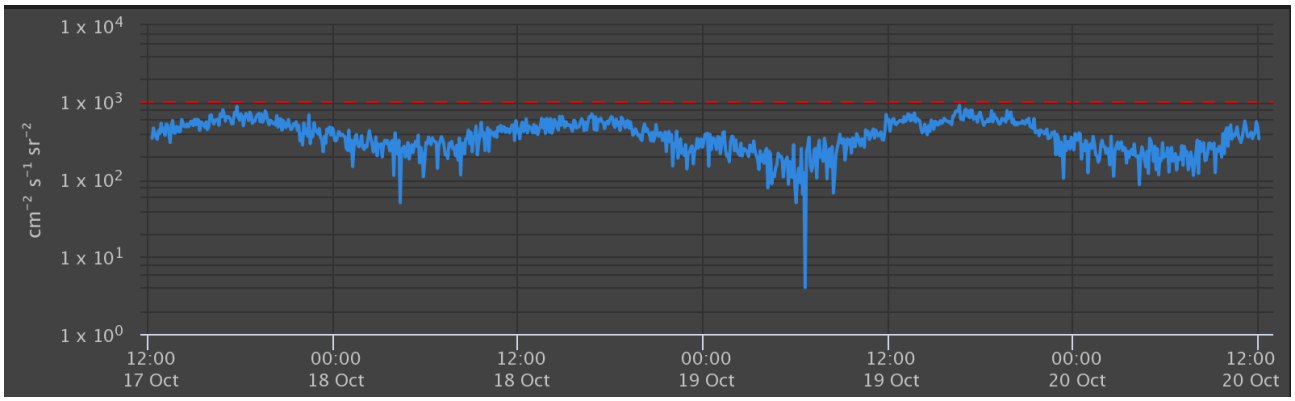
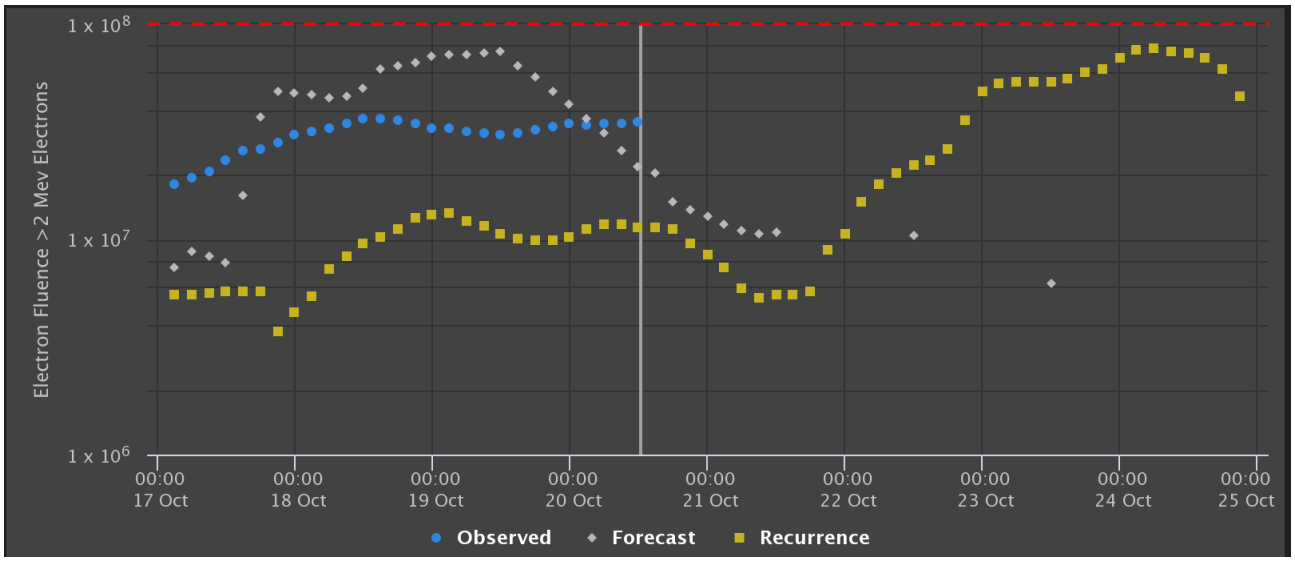


Figure 5: MOSWOC REF Model- Integrated electron fluence levels well below 1e8 alert threshold.



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.